

CASES AND TRACES

Unexplained Cardiac Arrest in an Apparently Healthy Young Woman

What Is the Underlying Substrate of the Arrhythmia?

ECG CHALLENGE

An 18-year-old woman with a history of anorexia nervosa and multiple episodes of dizziness and syncope of unknown cause was transferred to the emergency department by ambulance 1 hour after starting to feel palpitations, dizziness, tightness in the chest, and presyncope at school. At the time of presentation, she was hemodynamically stable, but the symptoms persisted. The ECG recorded at admission is shown in Figure 1A. A supraventricular tachycardia with aberrancy was suspected. Conversion attempts first with vagal maneuvers (carotid sinus massage and Valsalva maneuver) followed by adenosine (6 mg IV) were unsuccessful, but the ventricular rate and the QRS duration normalized gradually within 12 hours. The full cardiovascular and laboratory workup showed unremarkable findings, and the patient was discharged with prescription of metoprolol 25 mg/d.

One week after discharge, the patient was rehospitalized after experiencing syncope at school with rapid deterioration of consciousness. A transthoracic echocardiogram revealed severely compromised cardiac function, and extracorporeal membrane oxygenation was rapidly initiated. The ECG recorded at admission is shown in Figure 1B.

On the basis of ECG findings, what is the most likely cause of this patient's arrhythmias and cardiac arrest?

Please turn the page to read the diagnosis.

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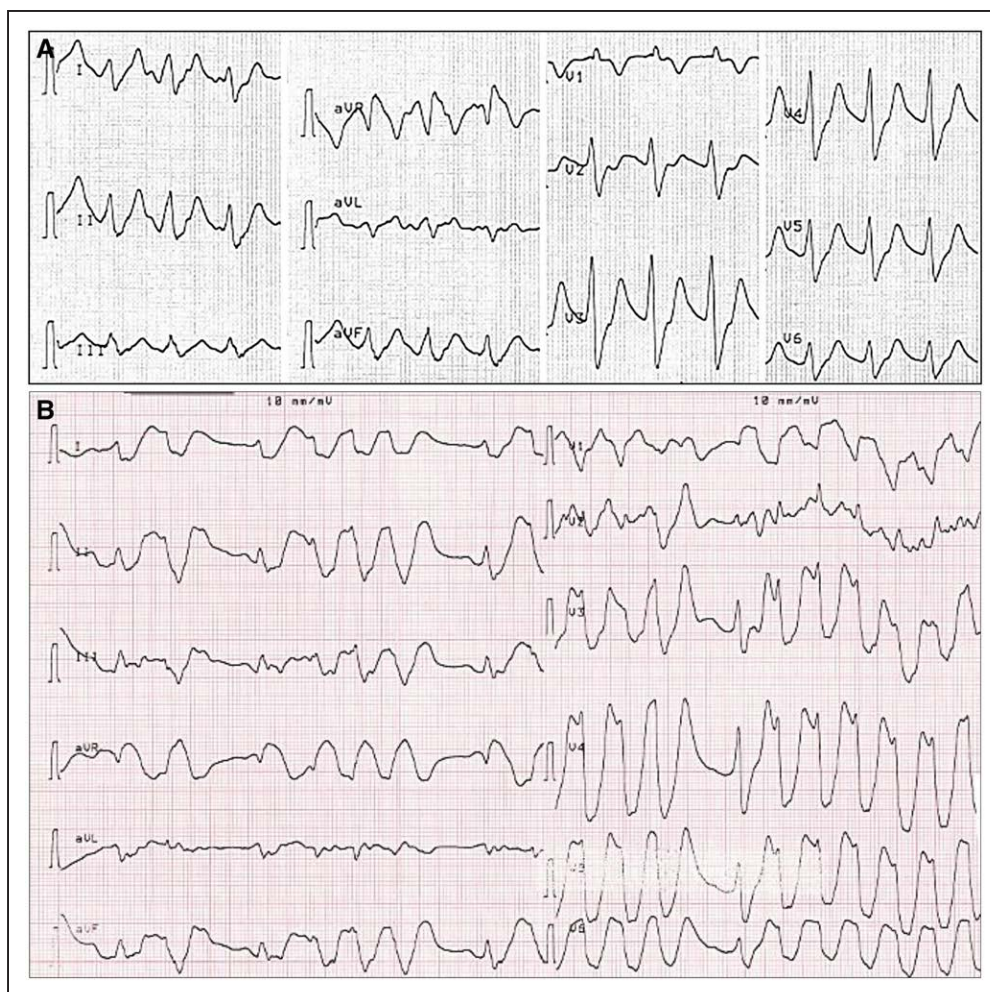


Figure 1. ECG obtained at the time of initial admission and readmission to the emergency department.

A, The ECG recorded at initial admission shows regular wide-QRS complex tachycardia with right bundle-branch block morphology and a ventricular rate of 120 bpm, no identifiable P waves, and no atrioventricular dissociation. **B**, The ECG recorded at readmission shows agonal heart rhythm with no P waves and wide, bizarre QRS complexes (550 milliseconds) that progressed to ventricular fibrillation. Sweep speed, 25 mm/s, 10 mm/mV.

RESPONSE TO ECG CHALLENGE

After resuscitation, an extensive diagnostic evaluation was undertaken in this patient, which, however, was unremarkable. Genetic testing for concealed inherited arrhythmia syndromes was also negative. The cardiac function recovered within 36 hours, and the QRS duration steadily normalized. The extracorporeal membrane oxygenation could be weaned after 2 days. The ECG recorded the following day revealed no abnormalities. During the hospitalization, she did not have any arrhythmias and remained in normal sinus rhythm. The

patient received an implantable cardioverter-defibrillator as secondary prophylaxis for sudden cardiac arrest of unknown origin and was discharged with metoprolol 25 mg daily.

One year later, she was rehospitalized for a similar arrhythmic episode. This time, the patient's mother reported to have found leaves of the yew plant in the patient's room. Later, the patient admitted to having taken nearly 100 yew leaves and to consuming them on a regular basis in variable quantities. After the diagnosis of self-intoxication-related arrhythmia, the implantable cardioverter-defibrillator was explanted, and the



Figure 2. *Taxus baccata* (European yew).

Obtained from <http://www.biolib.de>.

patient was referred to the psychiatry department for follow-up and treatment. After 1 year, no recurrences have been reported.

The actual cause of arrhythmia in this patient was ingestion of European yew leaves (Figure 2), an ever-green ornamental plant with spirally arranged needle-like leaves and well-known poisonous effects. To date, 15 yew species have been described. European yew is naturally distributed in central, western, and southern Europe; northern Iran; northwest Africa; and southwest Asia. However, during the last few years it has been introduced in Washington, Pennsylvania, New York, New Jersey, and Massachusetts. In North America, Canada yew is native and distributed from the Ohio River Valley to the far northeast of Canada; Pacific yew is distributed in the western United States; and Florida yew is distributed in the Apalachicola River area. The toxic effects of yew are attributed to the pseudoalkaloids taxine A and taxine B that are found in all parts of the plant except the red flesh of the berry. Taxine B is significantly more potent than taxine A and is highly cardiotoxic.¹ Functional studies later disclosed that the toxic effects of taxines are caused by their sodium (I_{Na}) and calcium (I_{Ca}) channel blocking properties, similar to the effects of class I and class IV antiarrhythmic medications, respectively. Further studies focused more on their inhibition of calcium current; this effect has been shown to be dose-dependent.^{1,2} The electrophysiological effects of taxines have been shown to lead to increases in atrioventricular conduction time and marked reduction in the depolarization rate of the action potential.² Taxol, another potent toxin found in yew, enhances tubulin polymerization, which in turn reduces sarcolemmal Nav1.5 expression and I_{Na} amplitude and causes impairment in I_{Na} inactivation.³ Preliminary studies have suggested that taxol may also increase the free intracytoplasmic calcium levels, but the precise mechanism is unclear.

These electrophysiological alterations manifest with initial sinus tachycardia followed by bradycardia, decreased myocardial contractility, second- and third-degree atrioventricular blocks, and significant QRS widening, eventually leading to persistent ventricular

tachycardia and ventricular fibrillation, as seen in our patient. In taxine intoxication, as well as any other sodium channel blocker poisoning, the prolongation of the initial part of the QRS complex (qR) accounts for a significant proportion of the prolonged QRS, whereas in aberrant conduction, QRS widening is typically caused primarily by terminal QRS (Rs). This electrocardiographic feature might be clinically useful for the early recognition of any sodium channel block-mediated toxicity. Taxine B has high cardioselectivity¹; other organs are usually affected to a far lesser extent.

This challenging case of cardiac arrest secondary to a suicide attempt with European yew leaves illustrates the importance of early recognition of typical electrocardiographic patterns of reversible causes of cardiac arrest for preventing recurrences and improving the prognosis in patients with poisoning-induced cardiac arrest.

ARTICLE INFORMATION

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Disclosures

None.

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